



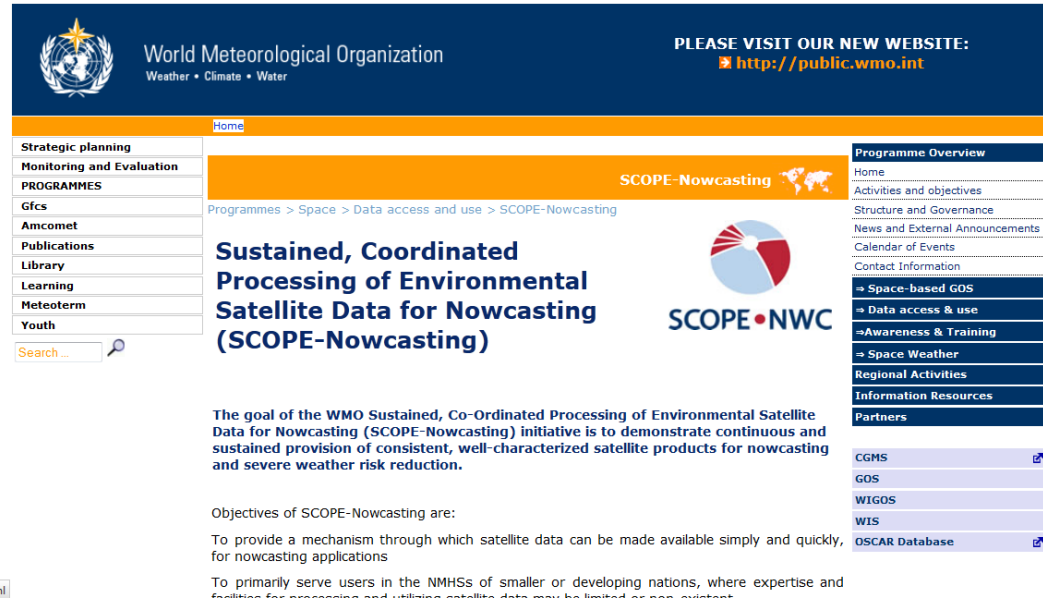
World Meteorological Organization

Weather • Climate • Water

Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting) Overview

Summary

- Description
- Background
- Objective
- Progress to Date
- Benefits
- Concept of Operations
- Role of Executive Panel
- Pilot Projects

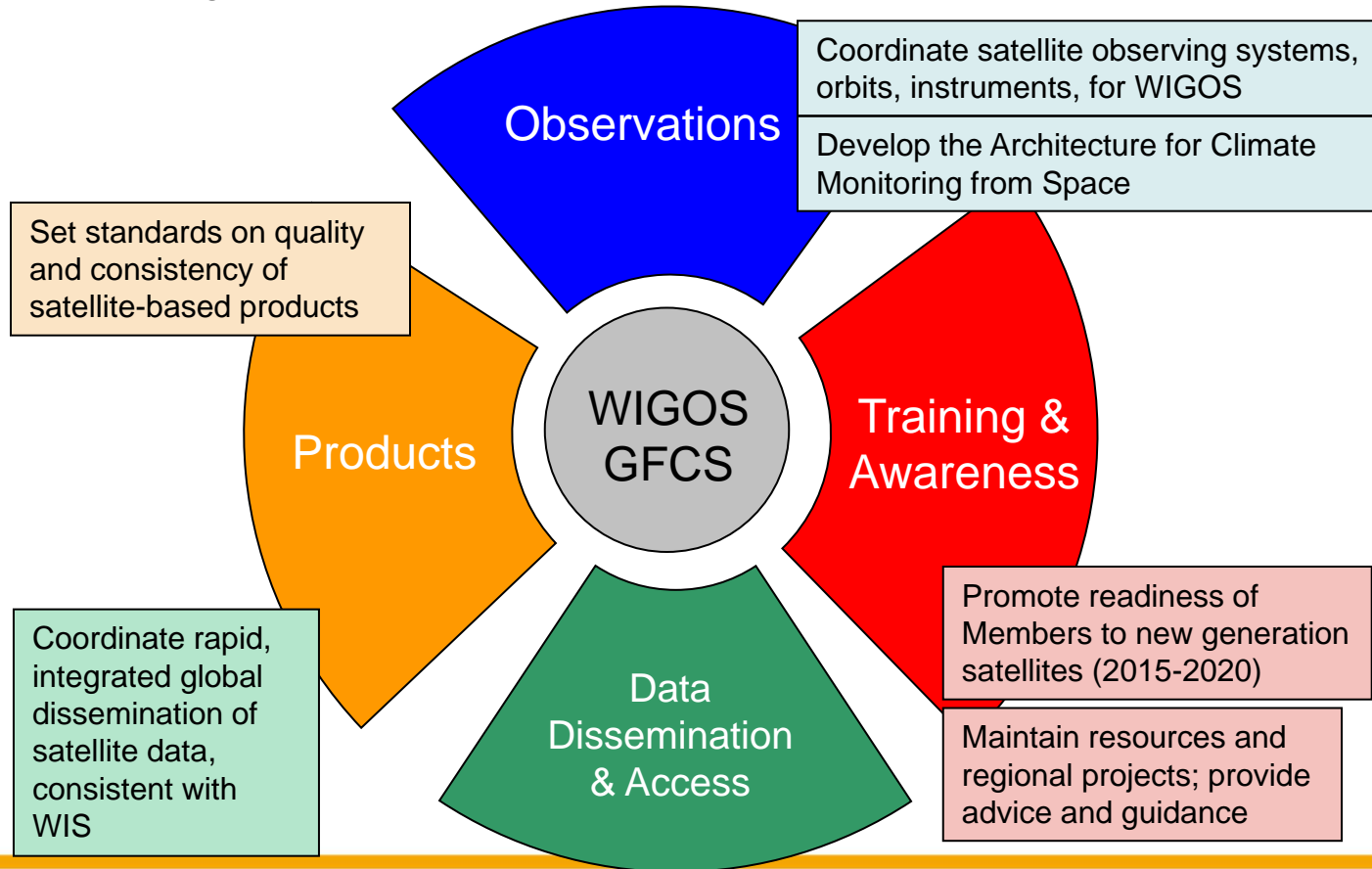


The screenshot shows the WMO website header with the logo and text "World Meteorological Organization Weather • Climate • Water". A navigation menu on the left includes "Strategic planning", "Monitoring and Evaluation", "PROGRAMMES", "Gfcs", "Amcomet", "Publications", "Library", "Learning", "MeteoTerm", and "Youth". The main content area features the title "Sustained, Coordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting)" and a sub-header "SCOPE-Nowcasting". Below the title is a paragraph: "The goal of the WMO Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting) initiative is to demonstrate continuous and sustained provision of consistent, well-characterized satellite products for nowcasting and severe weather risk reduction." Below this is a section titled "Objectives of SCOPE-Nowcasting are:" followed by two bullet points: "To provide a mechanism through which satellite data can be made available simply and quickly, for nowcasting applications" and "To primarily serve users in the NMHSs of smaller or developing nations, where expertise and facilities for processing and utilizing satellite data may be limited or non-existent". A right-hand sidebar contains a "Programme Overview" menu with items like "Home", "Activities and objectives", "Structure and Governance", "News and External Announcements", "Calendar of Events", "Contact Information", and "Partners".



WMO Space Programme: 4 Activity Areas

supporting weather, water, climate, and space weather



Description

The goal of the WMO Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting) initiative is to demonstrate continuous and sustained provision of consistent, well-characterized satellite products for nowcasting and severe weather risk reduction.

http://www.wmo.int/pages/prog/sat/scope-nowcasting_en.php



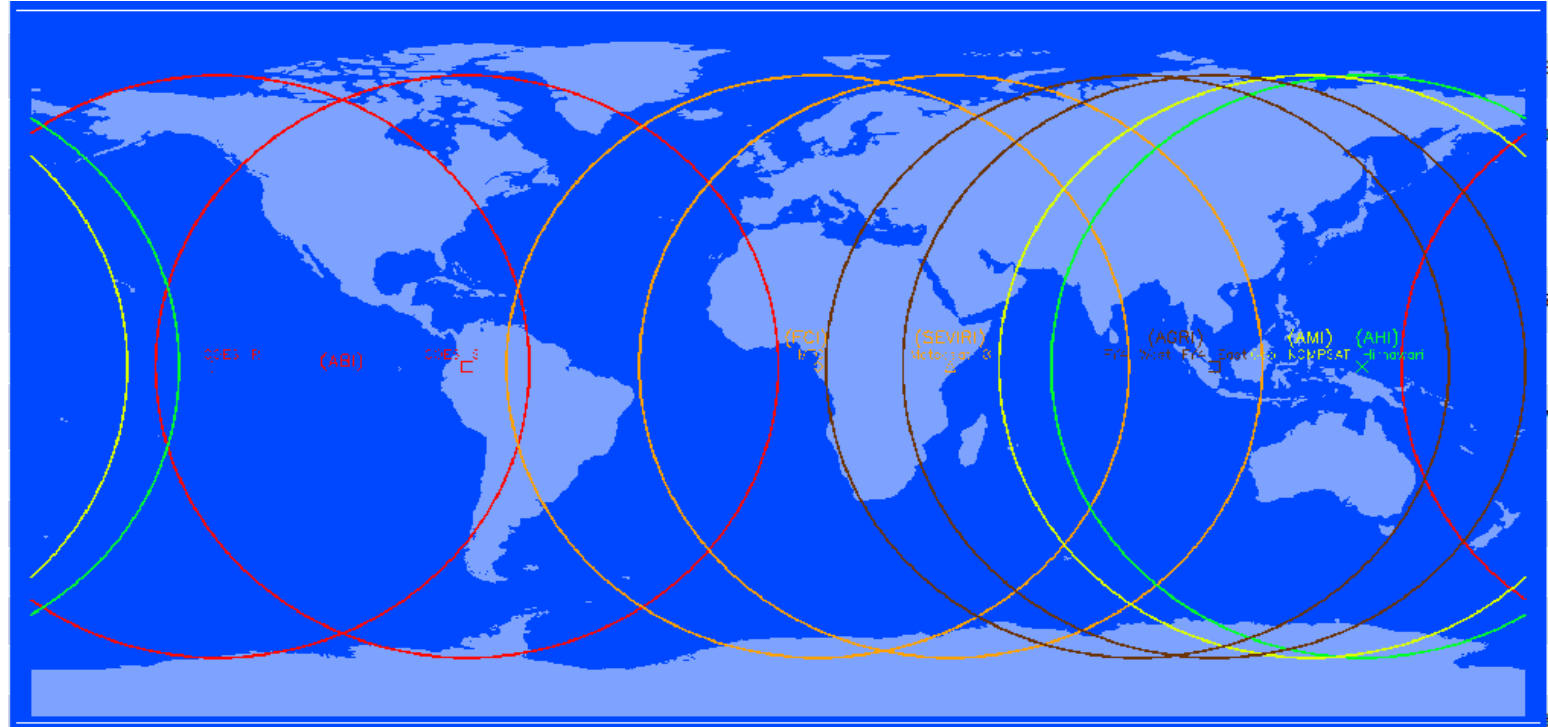
Background

For geostationary satellites, we are faced with overlap in

- Footprint
- Spectral Coverage
- Level 2 Products



Overlap in Footprint



... in Spectral Coverage

Central Wavelength [μm]	H-8 AHI	GOES-R ABI	FY-4A AGRI	GEO-KOMPSAT-2A AMI	MTG-I1 FCI
0.44 - 0.47	•	•	•	•	•
0.51	•			•	•
0.64 - 0.65	•	•	•	•	•
0.83 - 0.86	•	•	•	•	•
0.91					•
1.4		•	•	•	•
1.6	•	•	•	•	•
2.3	•	•	•		•
3.8 - 3.9	•	•	•	•	•
6.2 - 6.3	•	•	•	•	•
7.0 - 7.1	•	•	•	•	
7.3 - 7.4	•	•		•	•
8.5 - 8.7	•	•	•	•	•
9.6 - 9.7	•	•		•	•
10.3 - 10.7	•	•	•	•	•
11.0 - 11.2	•	•	•	•	
12.3	•	•		•	•
13.3 - 13.5	•	•	•	•	•



... in Level 2 Products

Level 2 Product Category	Himawari AHI	GOES-R ABI	FY-4A AGRI	GEO- KOMPSAT- 2A AMI	MTG-I1 FCI
Clear Sky / Cloud Mask and Radiances	•	•	•	•	•
Atmospheric Motion Vectors	•	•	•	•	•
Cloud Type and Microphysical Information	•	•	•		•
Cloud Top Height / Pressure /Temperature	•	•	•	•	•
Stability Indices		•			•
Aerosol Information, e.g. Optical Depth	•	•	•	•	•
Rainfall Rate / QPE		•	•	•	•
Solar Radiation (upward/downward)		•	•		•
Longwave Radiation (upward/downward)		•	•		•
Surface Properties (e.g. temperature, emissivity, albedo)		•	•	•	•
Fire Detection / Fire Radiative Power /Burnt Area		•	•	•	•
Volcanic Ash information (detection, height, mass loading)	•	•			•



Background

Overlap in coverage, channels, and products

- offers **opportunities** for a combined use
- **but**
- poses **challenges** for users in the area of data reception, data interpretation, and potential data redundancy

The WMO SCOPE-Nowcasting initiative addresses some of these challenges for nowcasting applications



Background

- Concept arose from discussions in 2010 (in the 5th meeting of the Expert Team on Satellite Utilization and Products, ET-SUP-5)
- ET-SUP noted the benefits of the SCOPE for Climate Monitoring (SCOPE-CM) initiative, where the value of different models of cooperation among satellite operators in generating satellite datasets for climate has been demonstrated through theme driven pilot projects

http://www.wmo.int/pages/prog/sat/scope-cm_en.php



Background

It was felt by ET-SUP-5 that the SCOPE concept could be well applied to the nowcasting domain, given that

- the related science is relatively mature
- an organized user community is available
- a description of the needs of this user community exists
- there are opportunities of synergy with other initiatives



Progress to Date

Presentation to CGMS-41 in Tsukuba in July 2013

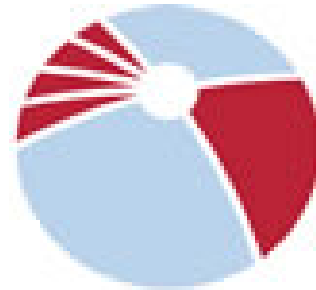
Actions arising:

- CGMS members to nominate focal points for the SCOPE-Nowcasting (NWC) initiative as appropriate Feedback from CGMS members sought on the final makeup of the SCOPE-NWC pilot projects
- First meeting of SCOPE-Nowcasting Team – 19-22 November 2013, WMO Geneva, with participation from CMA, JMA, KMA, EUMETSAT, NOAA and Bureau of Meteorology, where first 4 pilot projects were decided



Progress to Date

The 2013 meeting also decided on a Logo:



SCOPE • NWC



Objective

The key objective of SCOPE-Nowcasting is to provide a mechanism through which satellite data can be made available

- simply and quickly
- primarily for users in the NMHSs of smaller or developing nations, where expertise and facilities for processing and utilizing satellite data may be limited or non-existent
- but also for more advanced nations where there may be efficiencies possible through combining resources, expertise, and efforts



Objective

Operational

- Provide consistent and reliable satellite products to users to support nowcasting
- Demonstrate the concept through a number of pilot projects

Strategic

- Build strong relationships between product developers across different agencies
- Foster scientific collaboration across satellite operators
- Sustain product dissemination and facilitate user uptake



Objective

- **Product Consistency means**
 - Products have a long-term stable status, beyond an individual satellite mission
 - Products are generated routinely and in a repeatable manner
 - Products must include smooth transition between different satellite sources
- **Product Coordination means**
 - Products need to be consistent across platforms using comparable algorithms
 - Products should be provided in consistent, standard formats



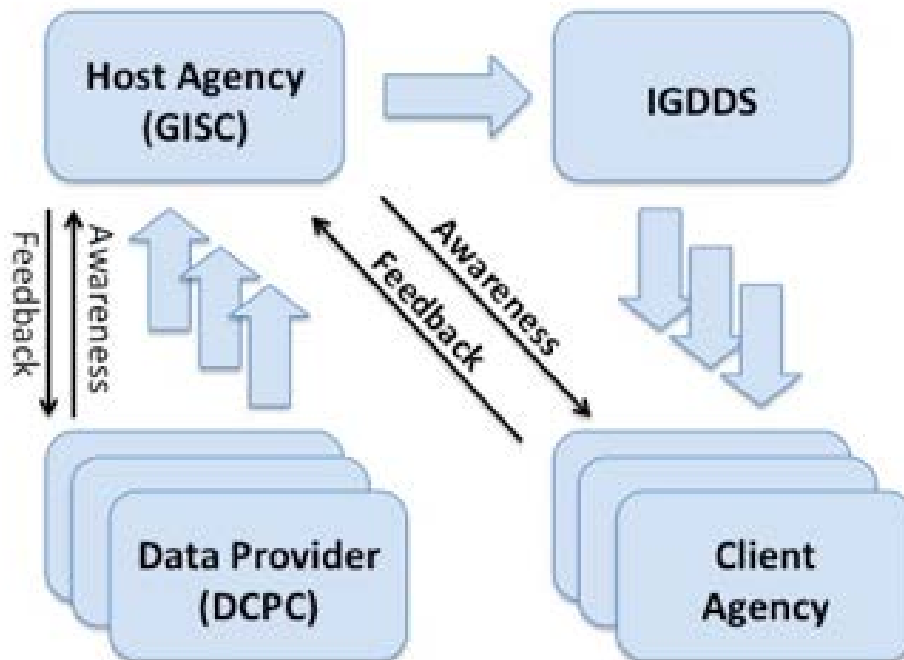
Expected Benefits

The expected benefits of this approach are:

- Improved access to satellite data by WMO member states
- Improved confidence in products generated through SCOPE-Nowcasting
- Reduced operating costs associated with technological change and software upgrades
- Reduced training overheads
- Improved cooperation between NMHSs through access to shared products
- Strong connections between scientists across agencies as a foundation for increased collaboration



Concept of Operations



See SCOPE-Nowcasting Concept Paper,

http://www.wmo.int/pages/prog/sat/documents/SCOPE-NWC_Concept-v1.2.pdf



Client Agency

- To define **requirements** and make **formal requests** for products to be generated over their area of interest
- To make **appropriate use** of the products to serve their end-users and to provide **feedback** to the Host Agency on issues and errors
- To regularly **liaise** with the Host Agency and Data Providers to remain aware of novel product developments, through training events or user conferences



Host Agency

- To **gather data** from the different Data Providers
- To **make data available** to Client Agencies in a timely and effective manner
- To provide a **contact point for Client Agencies** to raise issues or report problems
- To **compile feedback to Data Providers** based on reports by Client Agencies
- To **inform Client Agencies of novel developments** in data and product availability



Data Provider

- To **generate products** covering areas of interest
- To **provide products to the Host Agency** in a timely and reliable manner
- To **provide a point of contact** for data problems, issues, and feedback
- To **inform Host and Client Agencies of novel developments** in data and product generation and availability



Simple Example


Basic Imagery, e.g. VIS/IR or RGBs:

- Imagery products from different satellites for a given region (from Data Providers)
- Use of same (or very similar) RGB recipes



RGB Workshop defines RGB standards and provides training material:

- Stable product status
- Independent of satellite missions
- Routine and repeatable generation
- Standard format



Product
coordination and
consistency
ensured



Simple Example

Basic Imagery, e.g. VIS/IR or RGBs:

- Host Agency produces single channel images and RGB composites
- Availability e.g. through ftp or other simple means



End user does not need multiple reception stations and data processing facilities

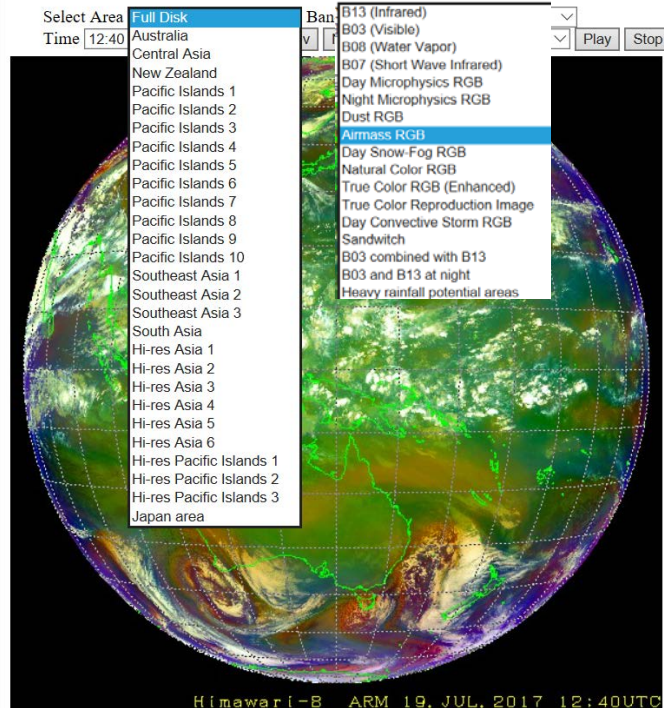
Full time domain can be exploited, as images may not be scanned at the same time

Imagery product is immediately understandable and usable



Simple Example

The RGB composite imagery is produced by composing satellite images colored in red, green and blue.
User's Guide to RGB composite imagery (Himawari RGB Training Library)



Example of simple web-based interface to basic imagery, offering different regions and different bands/composites (JMA website for Himawari)

http://www.data.jma.go.jp/mscweb/data/himawari/sat_img.php?area=fd



Role of Executive Panel

- The SCOPE-Nowcasting *Executive Panel* is responsible for overseeing all SCOPE-Nowcasting activities and ensuring that activities are coordinated appropriately.
 - Agreement on products and response to product requests
 - Designation of Data Providers and Host Agencies
 - Liaison with user community, data providers and other WMO groups
- For each SCOPE project, the Executive Panel may appoint a *working group* to realize the project, gather user feedback etc.
- Terms of Reference for Panel



Role of Executive Panel

- Concept Paper describes the Concept of Operations:
http://www.wmo.int/pages/prog/sat/documents/SCOPE-NWC_Concept-v1.2.pdf
- Terms of Reference for Executive Panel
http://www.wmo.int/pages/prog/sat/documents/SCOPE-NWC_ExecPanel-ToR.pdf



SCOPE-Nowcasting Pilot Projects

Projects cover the following four areas

- Basic nowcasting (mainly VIS/IR imagery, RGB products, etc.)
- Advanced nowcasting products (Level 2 products as e.g. stability indices, atmospheric motion vectors, quantitative cloud information, etc.)
- Realtime ocean products, e.g. scatterometer winds
- Realtime atmospheric composition products, e.g. dust, smoke, volcanic ash



SCOPE-Nowcasting Pilot Project Criteria

- Use of multi-satellite data
- Dataset formats can be read by standard tools
- Concise product documentation
- Open and easy access
- Available in near-real time (<6h)
- Availability of training information
- An official commitment from all agencies involved in the project



First Four Pilot Projects

Category	Product	Region	Provider	User	Gaps
Basic nowcasting	RGB composites	WMO Region II (Asia) and Region V (SW Pacific)	JMA, CMA, KMA	NMSs in Region II and V	No standard products available; products limited
Advanced nowcasting	Volcanic Ash Products	Global	CMA, JMA, KMA, EUMETSAT, NOAA	NMHSs, VAACs	No standard products available; products limited
Advanced nowcasting	Blended satellite global precipitation product (GEO+LEO)	Global coverage	Hydro Estimator, NASA TRMM (3B42), NOAA (real-time MW)	Civil authorities, NMHSs, Flash flood guidance systems, general users	Rapid, facilitated access to quantitative precipitation estimates
RT Atmospheric Composition products	Dust Monitoring and Prediction Products	WMO Region II (Asia) and V (South-West Pacific)	CMA, JMA, KMA	SDS-WDCs, NMSs (to issue results and warnings) in RA II and RA V	Regional diversity of aerosol-related products not harmonized



SCOPE-Nowcasting Pilot Projects

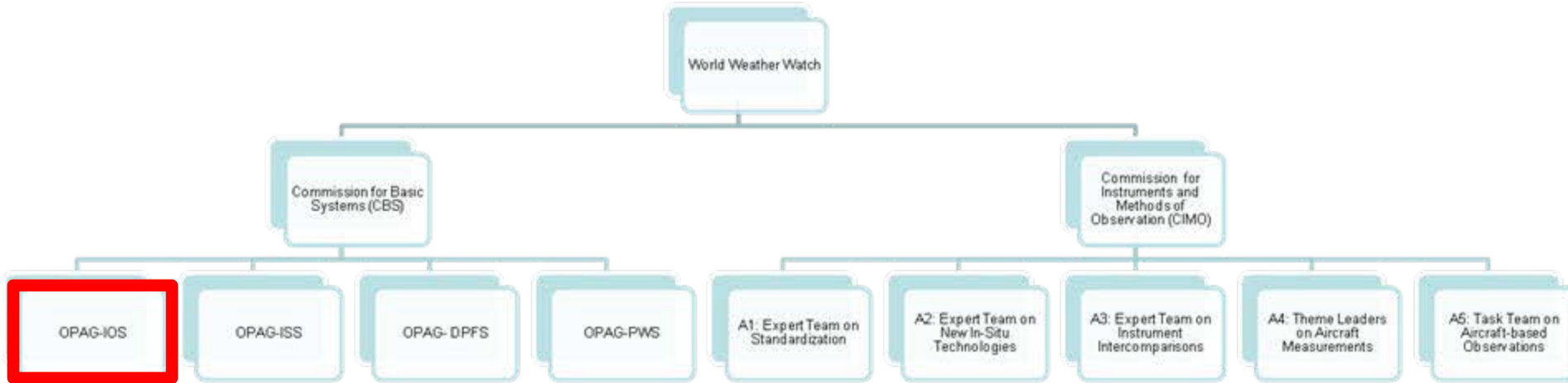
The pilots will be further described and discussed in agenda items #3, 9, 10

A full description of the pilots is available at

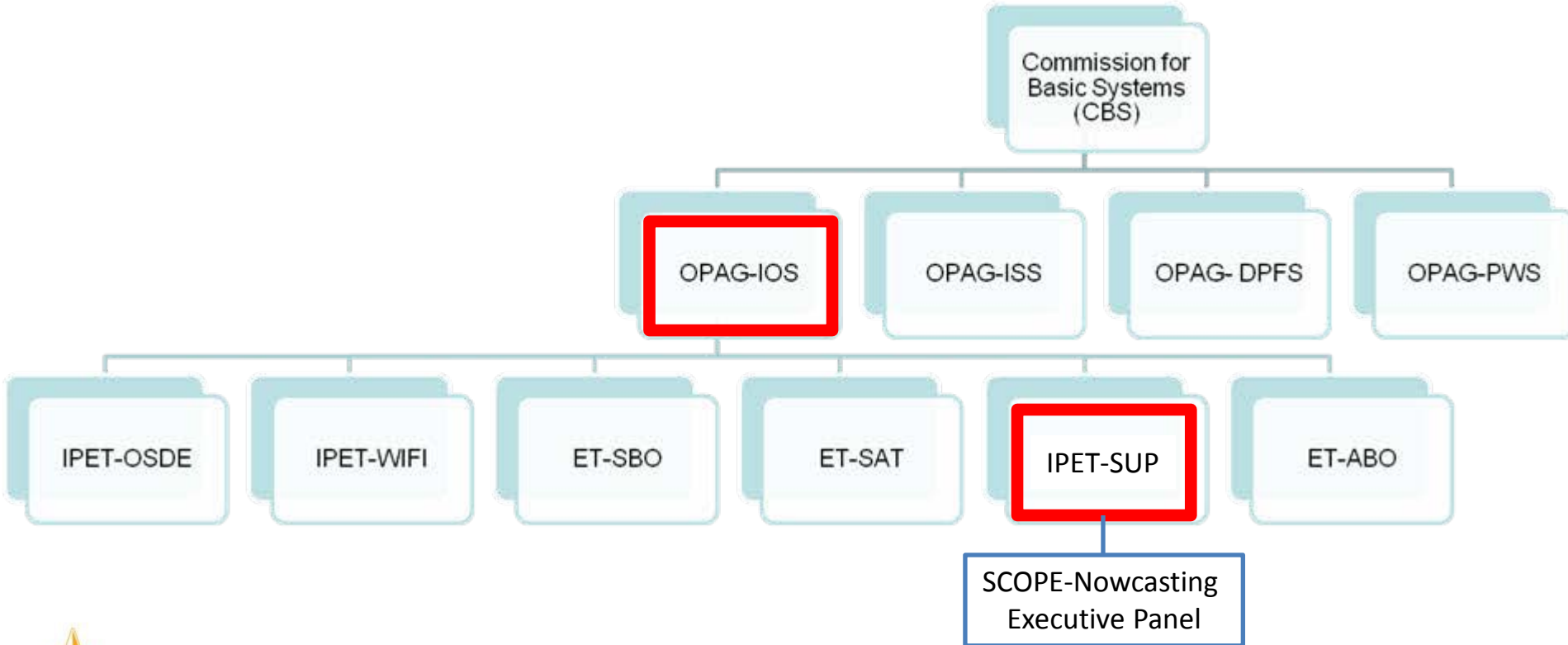
http://www.wmo.int/pages/prog/sat/documents/SCOPE-NWC_PilotProjects-Jan2017.pdf



WMO Structures and SCOPE-Nowcasting



WMO Structures and SCOPE-Nowcasting



IPET-SUP-3 (2017) Comments on SCOPE-Nowcasting

SCOPE-Nowcasting objectives appropriate, up to date.

SCOPE-Nowcasting pilots based on voluntary proposals to begin and help to develop the SCOPE-Nowcasting structure. However, the SCOPE-Nowcasting projects now should be designed to reach the SCOPE-Nowcasting goals (voluntary nature is not enough).

The group considered that SCOPE-Nowcasting should be viewed from the perspective of applications such as a) aviation, b) weather disasters, c) agriculture and others

Encouraged SCOPE-Nowcasting panel to discuss current and new pilots, potential new projects should be developed for each WMO Region in order to capture users' needs.

Besides the products, projects with the objective to develop conceptual models, guidance and training for specific applications will also be very important.

IPET-SUP-3 (2017) Comments on SCOPE-Nowcasting

Developing countries rarely have nowcasting systems: development of a software tool to integrate, visualize, animate and overlay local layers should be envisaged; this system could be open source, able to read several formats and upload local layers, and be user-friendly

IPET-SUP-3 (2017) Comments on SCOPE-Nowcasting

Pilot Project 3 (Precip, Global):

GSMaP will replace the HydroEstimator as soon as it is available in near-real time.

Duplication with NASA WorldView?

Pilot Project 4 (Sand and Dust, Asia)

Products from CMA NSMC such as FY-2E/VISSR IDDI, FY-3B/VIRR DII will be important for the SDS-WAS system, and linkages to the centres in Beijing, Barcelona, and the Republic of Korea should be sought.

Dust indices are an important product for Northern Africa, and their provision by the SDS-WAS node in Barcelona is encouraged.

Comparison of Himawari-8 and FY-4A aerosol products should be made once FY-4A data are available. Collaboration with the data assimilation group run out of the Asian node of SDS-WAS should be sought.

Exchange of surface- based validation data is also very important.